Elmo Rietschle
A Gardner Denver Product

Directions for Use
and
Service Manual

for compact units of Types from WPB 120 to WPB 8300,
and of Types from WVB 120 to WVB 8300,
and
Base units of Types from WPB 120 to WPB 8300

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Quality certificate
Connection diagram of the electric motor (not included in this Manual, submitted on request)

1. INTRODUCTION

1.1 BASIC INFORMATION

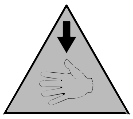
The Directions for use and service manual for the SHARK compact unit and base units (hereinafter referred to as the Manual) contain important directions to be observed throughout the machine's operating life, starting on receipt of the machine. The manual has been compiled for complete SHARK series. It also applies to separately delivered base units. Before installing and/or putting the machine into operation, you must familiarize yourself with this manual in order to ensure trouble-free and safe operation of the machine and a long operating life. The manual mentions and quotes safety regulations to be considered particularly during machine operation. It is necessary that the personnel responsible for the machine operation and maintenance have this manual at their disposal so that operation and maintenance is done in accordance with the instructions stated in this manual. We recommend entrusting repairs and redesigns only to Rietschle Thomas (RT) specialists. If under guarantee, the machine shall be disassembled only by RT specialists or persons authorized by RT.
The manual contains only instructions for use of standard blowers and blower sets designed for air transport. The instructions for use of non-standard blowers and blower sets for transport of other gases must be consulted with the manufacturer.

The instructions stated in the manual apply to the blower set, the quality certificate of which is enclosed with this manual. If any failure occurs, immediately contact the Section for Business-technical Services (hereinafter referred to as the RT service department). When contacting RT about any problem, state the data from the type plate: the type and serial number of the blower set or blower.

1.2 SYMBOLS USED IN THE MANUAL

Caution: Read the directions for use!

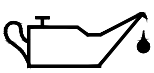
Warning: Overlooking these instructions might cause damage to the machine and/or slight injuries.



Warning: Danger of injury

Warning: High temperature risk

Caution: Wear ear protectors!



Oil filling

Forbidden: Do not turn on the machine!

Forbidden: Do not use a hammer!

Suspension

2. TRANSPORT, HANDLING AND STORAGE

2.1 TRANSPORT AND TRANSPORT DATA

Delivery

Delivered blower sets are assembled as complete units. Delivered belts are not installed on the machine. The pendulous motor frame is secured by bolts in the bottom position. Delivered compensators and non-return valves of larger SHARK types (supplied with noise-damping hoods) are not installed on the machine. Blowers are delivered without oil fillings. The delivery contains the accessories specified in the purchase contract. The dimensions and weight are stated in the dimensional drawing of the appropriate blower set, which is enclosed with the Manual.

Transport

Compact units must be transported in protected freight space.

Blower sets must be transported with belts removed! Otherwise, the shaft or bearings could be damaged. During transport, the pendulous motor frame must be secured by appropriate bolts in the bottom position!

Receipt

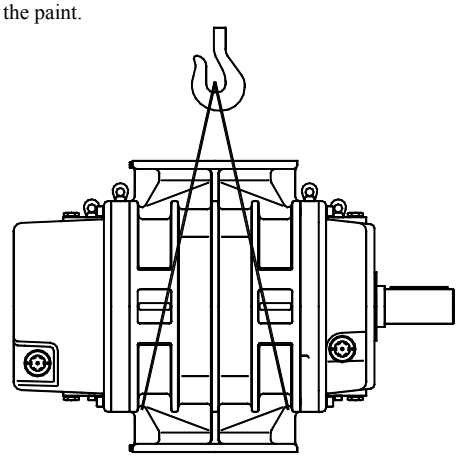
On receipt, the delivery must be checked with the delivery notes for completeness. Any potential damage caused during transport must be recorded in the presence of the carrier. The record signed by the carrier must be immediately submitted to the supplier.

2.2 HANDLING

To handle the machine, use a forklift truck and/or crane as described below.

Base unit

The picture shows the handling of a base unit. To handle the blower, use soft binding ropes. Steel wire ropes can be used provided they are padded in order to prevent damage to the paint.

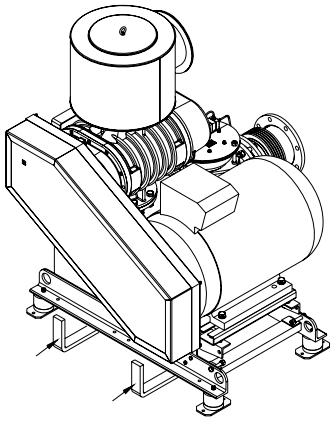


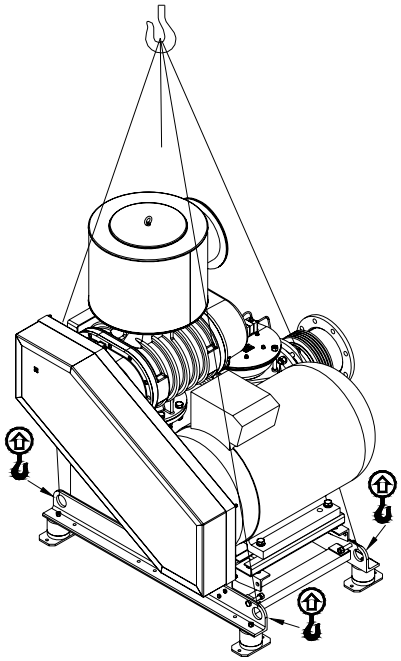
WARNING
On no account should the blower be lifted with the ropes attached to the flanges!

Compact unit

To handle the compact unit, use a forklift truck and/or crane. The following pictures show the ideal handling of blower sets. To handle the compact unit with a crane, use soft binding ropes. Steel wire ropes can be used provided they are padded in order to prevent damage to the paint. Further, you must avoid using too short binding ropes in order to prevent deformation of the suction filter during transport.

WARNING
On no account should the compact unit be lifted with the ropes attached to the set bases, blower flanges, suction silencer, and/or motor!

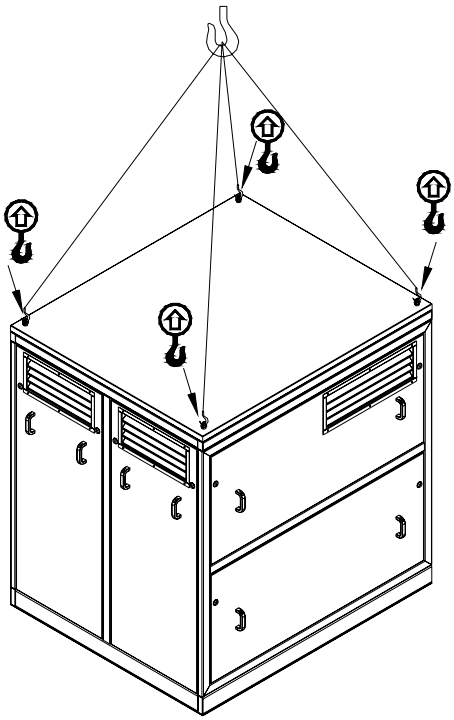




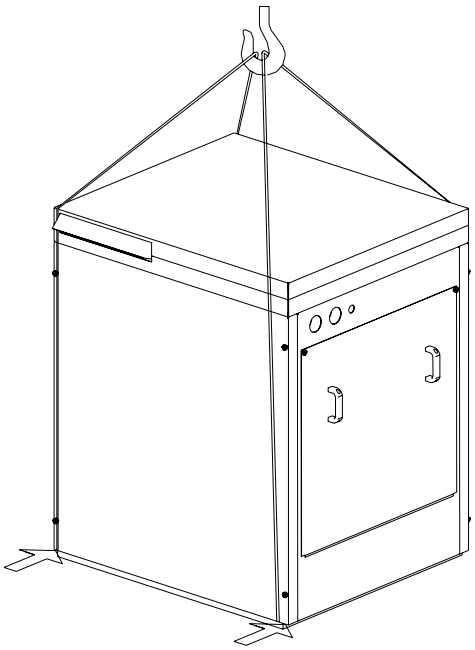
Acoustic enclosure

Smaller types of acoustic enclosures, in which compact units are placed, can be handled by a crane or a forklift truck. Ropes must be placed under the bottom base as displayed in the picture - in the direction shown by the arrows. The forks of the forklift truck must also be placed in the direction shown by the arrows.
Larger types of acoustic enclosures are equipped with lifting-eye nuts. If crane handling of the hoods is impossible, they can be handled with a forklift truck. When handling the enclosure with a forklift truck, you must put baulks on the truck forks (where the enclosure is placed) in order to prevent damage to the enclosure. The enclosure can also be disassembled into individual parts and then reassembled at the place of installation. The following pictures show the handling of acoustic enclosures.

Without a compact unit



With a compact unit



Motors

The handling of motors is described in the motor manual. For handling, motors are usually equipped with eye screws.

2.3 Storage conditions

The blower set must be stored in its original packaging in a dry place and must be protected against dust. Compact units in the acoustic enclosure intended for outside use can be stored in the open air. If the blower set has been stored for more than six months, you should (re)preserve it. For this purpose, you can use standard preservative agents.
Storage conditions:
Temperature: -30 °C up to 40 °C
Relative humidity: up to 80%

3. Installation and assembly

3.1 Assembly conditions

Assembly in the Open Air
To install the blower set (the set including the enclosure) in the open air, you must consider the local conditions (snow, possibility of flooding, etc.)

Service passages and the space necessary for the set assembly in the machine hall are shown in Appendix 3.
Acoustic enclosures designed for outside use also serve as weather protection.

Assembly in the machine hall
The minimum dimensions of the machine hall are based on the maximum dimensions of the compact unit (acoustic enclosure) and the necessary 1-metre (better 1.2-metre) operation space at the sides of the blowers (enclosures) and between the blowers (enclosures). They are further based on the 1.2-metre space between the wall of the discharge section at the acoustic enclosure and the wall. The machine hall height depends on the method chosen for handling the machine(s).

3.2 Space necessary for installation and operation

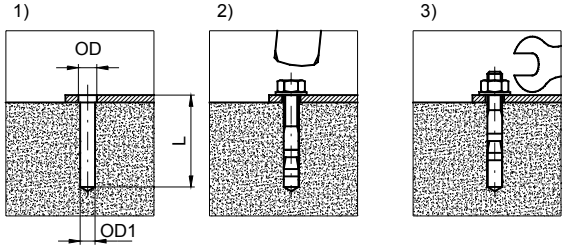
When designing the machine hall, you must remember the openings for the blower sets (the delivered sets are normally assembled). The acoustic enclosure are demountable. You should consider equipping the machine hall with an overhead track for a crane crab or leaving enough space for a forklift truck in order to handle those blower sets to be maintained or repaired (necessity to dismantle the blower and/or motor if a failure has occurred).
The space necessary for installation of individual types of SHARK blower sets can be derived from the dimensions stated in the dimensional drawings.

3.3 Requirements for anchoring the blower set or blower

The floor designed for installation must be flat and dimensioned for the machine weight and anchor length. With respect to the loading capacity, no special requirements are stipulated for the floor design since both the blowers and motors are dynamically balanced. The mechanical oscillation power of the blowers and motors are stated in Tables 3 and 4. The weight of the blower set is distributed between its individual bases. The weight of the delivered blower set is stated in its appropriate dimensional drawing.
The blower set must be positioned horizontally by placing plates under the machine bases. The permitted deviation is 1 mm for 1 metre.

WARNING
After being set in its position, the blower set must be anchored to the floor. Otherwise, it could move spontaneously and thus be damaged.

Working procedure for anchoring compact units and acoustic enclosures.
1. Drill a hole and clean it;
2. Stick the anchor into the hole; and
3. Tighten the nut.



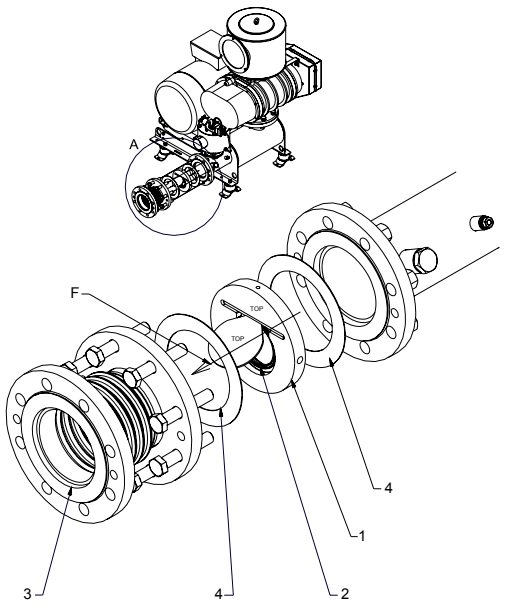
Compact unit – acoustic enclosure	Anchor	OD [mm]	OD1 [mm]	L [mm]
WPB/WVB 120 – 430	Upat EXA M 8K	9	8	40
WPB/WVB 550 – 8300	Upat EXA 12/15	13	12	90
K 42 - K 202	Upat EXA M 8K	9	8	40
K 302 - K 802	Upat MC 12/70	13	12	65

The space and diameters of the base holes are stated in the enclosed dimensional drawing of the compact unit. The procedure for anchoring acoustic enclosures is the same. You should, however, pay attention to the tightness of the gap between the hood and the floor. After setting the hoods in their positions, you must also level any floor unevenness in order to prevent the sidewalls from being tight. In order to seal the gap between the hood and the floor, you can apply polyurethane foam, for example. The electric cable must be laid in the floor.
If you intend to put a blower set in the hood on a half grid, you must order a non-standard enclosure because the bottoms of the acoustic enclosures are not soundproof.

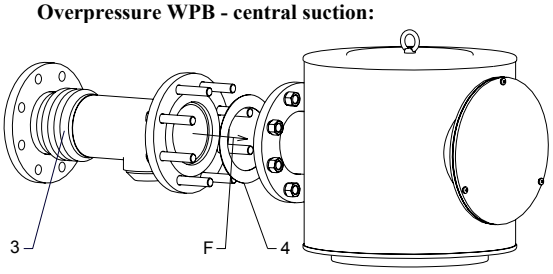
3.4 Requirements for connecting the pipeline

Connecting the pipeline to the SHARK compact unit
Since the entire aggregate is placed on rubber dampers, the pipeline must be connected through flexible elements. Otherwise, the running blower could shake the pipeline, thus increasing the noise level. Standard compact units are delivered with compensators for connection of the discharge section. If a SHARK blower for vacuum is been required or intended to be connected to the central suction, a compensator for connection of suction is also supplied. Delivered compensators and valves of larger blower sets supplied with acoustic enclosures (from the K 302 type) are not installed. These parts must be installed behind the outlet flange of the discharge silencer or also in front of the inlet flange of the suction silencer according to the following pictures:

Overpressure WPB:

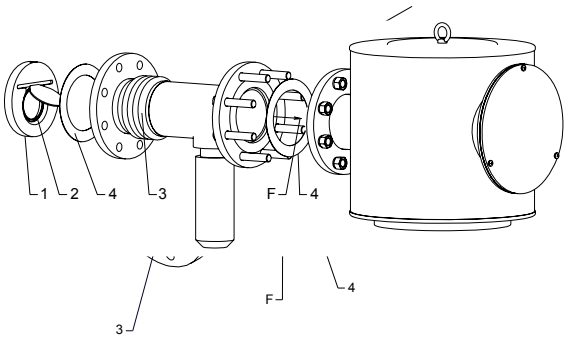


Overpressure WPB - central suction:



F Air flow
1. Non-return valve
2. O-ring
3. Compensator
4. Sealing

Vacuum version WVB:



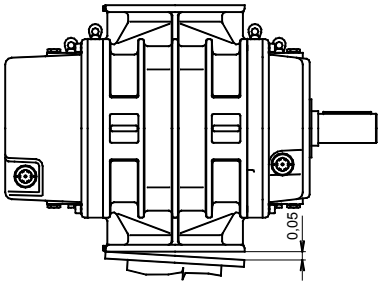
F Air flow
1. Non-return valve
2. O-ring
3. Compensator
4. Sealing

While overpressure blower sets contain discharge pressure gauges, vacuum blower sets contain suction pressure gauges. If either a non-standard blower set or a separate blower is delivered, a pressure gauge must be installed on the pipeline as near the discharge flange of an overpressure blower set/blower or the suction flange of a vacuum blower set/blower as possible. Due to gas pulsation, it is necessary to use pressure gauges resistant to cyclical fluctuations in the pipeline pressure, for example glycerine-charge pressure gauges. If you use an ordinary pressure gauge, an absorber must be installed between the pipeline and the pressure gauge. After setting the blower set in its position, you must open the plugs of the glycerine-charge pressure gauges in order to de-aerate them. Otherwise, they will indicate incorrect values! If a blower set with a acoustic enclosure is delivered, once it has been set up it is necessary to interconnect the pressure gauges installed on the enclosure and the measurement points on the blower set with the supplied tubes.
For overpressure blower sets: the point on the blower's suction flange located below the suction filter must be interconnected with the button connected to the pressure gauge that is designed for measurement of filter insert clogging. Further, the point on the discharge silencer must be interconnected with the glycerine-charge pressure gauge.

For vacuum blower sets: the point in front of the suction filter must be interconnected with the pressure gauge installed on the hood.

Connecting the Pipeline to the SHARK compact blower
You must ensure that the intake medium is free of impurities.
Blowers could suck in outside air. Equipping the blower with a suction filter produced by RT will suffice in order to ensure purity of the intake air.
If a pipeline is to be used for transport of air to the suction part, it is suitable to equip the blower with a RT suction filter (used for vacuum blower sets) in order to connect the pipeline. It is also necessary to install a compensator between the suction filter and the pipeline.
If the intake air is filtered centrally for more blowers, you must carefully clean the suction pipeline of foreign particles. A compensator must be installed between the blower and the suction pipeline. It is suitable to use a suction sieve installed as near to the blower's suction flange as possible for the first 500 operating hours. Suitable sieve densities can be derived from the following table, which provides permissible sizes of impurities for individual blower types:

It is not permissible to load the blower sockets with the pipeline. Before being bolted together, the flanges of the pipeline and the blower must fit closely. The maximum gap in the gasket circumference can be 0.05 mm, as shown in the picture.



After the flanged connections have been tightened, the blower must spin smoothly!

Rules for connecting the pipeline:
- The pipeline must be installed in the compensator axis.
- The pipeline must be placed on both fixed and sliding points. It is not permissible to load the compensator with the pipeline weight. The first fixed point of the pipeline must be as near to the compensator as possible.
- The pipeline diameters should not be smaller than the nominal inside diameters of the blower flanges.
- The recommended flow speed in the pipeline should be below 22 $m.s^{-1}$.
- If possible, large radii of pipe bends should be used (in order to reduce loss).
- The closing fittings must be installed near the branches in order to prevent impurities from accumulating in the blind pipeline branches.
- Hot (discharge) pipelines should be insulated.
- The wall openings should be flexible and the pipeline in them should be soundproofed (do not cement the pipeline in the openings).
- Compensators should be installed on long and branched pipelines.
- You should avoid the pipeline running perpendicularly into the registers. You should check the lengths of those registers where standing waves could occur for the excitation frequencies of sextuple blower revolutions (the frequency of the air pulsations).

When designing pneumatic transport, cement clarification, and similar applications where contaminated transported air (the volume between the non-return valve and the technological device) could expand after the blower has been turned off, you must consider such applications or ensure that the pollutants are separated when the air is flowing back (the mechanical non-return valves do not close immediately). Contact RT in these cases.

3.5 Instructions for connecting the blower set to the power supply

Warning: Only authorized persons with appropriate electrical qualifications are allowed to connect electrical devices.

Blowers, compact units, acoustic enclosures and electric motors are equipped with earth lugs. The protection of the standard blower set is determined by the electric motor protection (IP 55).
The wiring must meet the requirements for machinery in accordance with the 98/37/ES Directive and primarily the requirements stipulated in the EN 60204-1 Standard. Such requirements must be ensured by the electric part supplier. The standard deliveries of the RT blower sets contain only the electric motor terminals. If the delivery also includes the control system, only the power cable (if not included in the delivery) must be installed and connected. More detailed instructions are given in the separate manual for the control unit.
The supply cable must not restrict the movement of the motor and its pendulous frame!
Electric motors should be connected in accordance with recommendations from their Manufacturers. The connection diagram is attached to the inside of the cover of the electric motor's terminal block. We recommend starting

Blower WPB / WVB	**120**	**300 400 430 550 750**	**780 1000 1300**	**1600 2000**	**3000**	**4000 5000 6500 7000 8300**
Permissible impurity size [mm]	0.01	0.05	0.07	0.09	0.1	0.2

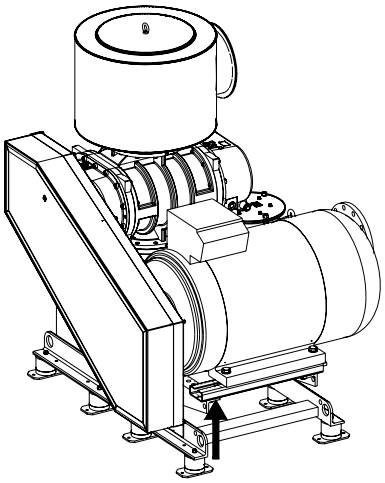
the electric motors in the star-delta connection (soft-start, etc.) even when the user could connect high-power electric motors directly (in the delta connection). The "soft" start saves the blower.

WARNING
Electric motors with power of over 11 kW must not be started directly (in the delta connection) without approval from the blower's manufacturer.

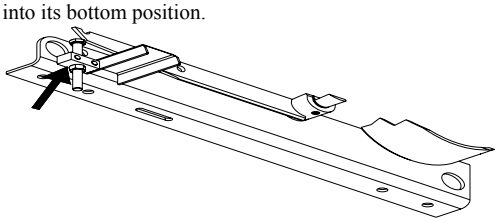
The electric motors of the compact units with acoustic enclosure must be connected so that they cannot be turned on if the electric motor fans in the acoustic enclosure are not running – the fans must exhaust air from the enclosures. Appendices 9 and 10 show the connection diagrams.

3.6 Belt installation

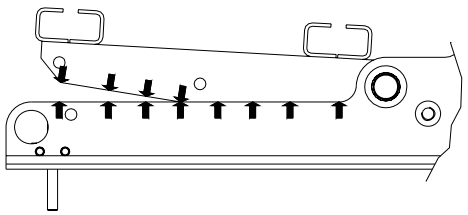
Due to transport of blower sets, the delivered belts are not installed and the pendulous frame with the motor is secured by bolts in the bottom position. Belts can be put on only when the blower set has been set in its position. You must first remove the bolts securing the pendulous motor frame in the transport position. In order to lift the frame, you must use a jack with the appropriate lifting capacity. An arrow shows the point to place the jack. For smaller blower sets (up to the size 2000), it is sufficient to use a screw jack with a lifting capacity of 700 kg (the type used for lifting private cars). For larger blower sets [from the size 3300 with motors from the 280 type (axial height in millimetres)], you must use a jack with a lifting capacity of 2,000 kg, preferably a hydraulic one. The jack must be placed on a solid base. If the jack is placed on a smooth surface, such as a pavement or painted surface, you must secure it with a rubber pad, for example, in order to prevent it from slipping. Before starting any operation, you must prevent the lifted pendulous motor frame from falling by using suitable supports.



On the inside of the frame sidewall below the pendulous motor frame, you must then install a stop checking the lower limit of the pendulous motor frame misalignment. Before putting on the belts, you must screw the stop bolt into its bottom position.



WARNING
When putting on the belts, be very careful you do not injure yourself by a suddenly falling pendulous motor frame that might come loose. You must hold the belt only at the place that will not be in contact with the pulley when the pendulous motor frame has been lowered. It is also forbidden to touch the blower set at the places between the edges of the sub frame and the pendulous motor frame, where a cutting effect will occur when the pendulous motor frame is moving.



Before putting on the belts, you must remove the supports securing the pendulous motor frame in the lifted position. When gradually lowering the pendulous motor frame, you must ensure that the belts remain in the pulley grooves. Since the pendulous motor frame is secured in its working position only by tightened belts, you must therefore prevent it from sudden loosening (with a jack, for example) before adjusting the stop. The stop bolt must be adjusted to a sufficient height so that the pendulous motor frame does not hit it when the motor is starting. When new belts are being installed, it is better to leave a larger gap between the stop bolt and the pendulous motor frame as the frame will lower after the belts have been set in their positions.

3.7 Precautionary measures

- The machine owner is obligated to observe the provisions of this manual.
- The machine owner is obligated to maintain the minimum spaces stipulated in this manual.
- The machine owner is obligated to see to good readability of safety labels and markings.
- The machine owner is obligated to provide operators with the protective equipment stipulated in this manual.

3.8 Machine hall ventilation

Machine hall ventilation

The machine hall is warmed by the heat radiated from the motors, blowers, discharge silencer and discharge pipeline. In order to reduce the machine hall temperature, the heat must be suitably dissipated (machine hall ventilation). If the output temperature is high, it is necessary to insulate the outlet pipeline. In most cases when blower sets suck air directly from the machine hall, you must ensure forced ventilation of the machine hall.

WARNING
It is not permissible to direct flow of cool air towards any part of the blower casing. Local cooling causes thermal deformation – the blower could thus be damaged.

Appendix 8 shows the ventilation diagram. When designing the machine hall, you must remember sufficient openings for both cooling air intake and warmed air exhaust. It is assumed that the fans will be located in the exhaust section. Cooling air intake for the blower suction from the machine hall must be designed so that sufficient volumes of both cooling air and air sucked by the blower set are ensured. If the intake air is transported from outside by a pipeline, it will suffice to dimension the inlet opening only for the cooling air volume and fit the exhaust section with fans of the required capacity. The air speed in the openings should range between 5 $m.s^{-1}$ and 10 $m.s^{-1}$. The suction and exhaust openings must be designed so that no noise will escape from the machine hall.

4. MACHINE

The RT SHARK-compact units sets are fitted with RT base units of the Roots type with three-tooth rotors.

4.1 BLOWER DESCRIPTION

The Rietschle Thomas Roots blowers work on the principle of oil-free gas transport. These blowers are the most widespread type of two-rotor blowers. The axes of the rotor rotation are parallel. A synchronizing gear, both of whose wheels have the same number of teeth, moves the rotors. The synchronizing gear ensures contact-less movement of the rotors. The rotors turn against each other. Both the suction and discharge sockets run between the rotor axes. The blower transports gas without increasing the pressure. Gas is compressed in the discharge socket by the gas that has already been transported (blowers with external compression).
The rotor seals of the standard blower types are not subject to wear. Since the seals do not ensure absolute tightness of the blower, the oil levels in the covers must not exceed the stipulated limits. Otherwise, oil could leak into the blower's working space or outer space. **In order to prevent oil from leaking during transport and/or handling of the blower, you must fill oil before putting the machine into operation.**

Blower Drive

Blowers are mostly driven by electric motors. A belt drive normally transfers the torque from the motor shaft to the blower shaft. The blower shaft is a part of one rotor.

4.2 BLOWER SET DESCRIPTION

Blower sets are shown in the dimensional drawings of the individual types that are enclosed with this Manual.
The main parts of the blower sets are:

- **A suction filter -** a resonance silencer with a filter insert.
- **A discharge silencer -** a welded construction of the base frame and the vessel. It serves as a supporting element for the blower and is also designed to suspend and secure the pendulous motor frame.
- **A pendulous motor frame** - it is suspended by pins in the silencer frame. It enables the belts to be tightened by tipping the motor.
- **A non-return valve –** an inter-flanged type. The non-return valve of the overpressure machine type is installed at the discharge section while that of the vacuum machine type is installed at the suction section.
- **A safety valve -** it serves as overload protection of the blower.

a) **Overpressure version:** if the valves are opened, air (gas) is released into the atmosphere. Directly controlled, HEROSE spring valves are used in smaller blower sets. Their opening pressure is set by spring bias. Larger types of blower sets are protected indirectly by controlled combined safety and starting valves (see the PVO valve description for more detail information).

b) **Vacuum version:** if the vacuum set by the spring has been exceeded, the seat will lift and air will be sucked from the atmosphere into the suction pipeline. The used valves are directly controlled and spring-operated. Their opening pressure is set by spring bias.

- **A compensator -** metal bellows.
- **An electric motor -** a bottom, fixed-speed or two-speed electric motor.
- **A belt drive with V-shaped or toothed belts.**
- **A belt guard -** it is made from common constructional steel.

The standard blower sets in acoustic enclosures are not equipped with a belt drive guard because the enclosure itself protects the drive.

- **Bases with rubber dampers -** they minimize transfer of vibrations to the bases.
- **A visual indicator of suction filter clogging.** For blower sets in acoustic enclosures, a pressure gauge is used instead of the indicator.
- **A discharge overpressure gauge or a suction vacuum gauge.**
- **Optional accessories:**

a) **A suction pressure gauge,** or an electric indicator of filter clogging instead of the visual indicator.

b) **An electric motor.** You can choose a fixed-speed or two-speed motor or a type of motor where a frequency converter changes the motor revolutions.

- **Special accessories:**

a) A acoustic enclosure for inside or outside installation.

b) Pressure and temperature sensors.

c) An auxiliary discharge silencer of the vacuum blower set. It (usually with a acoustic enclosure) serves to reduce noise made by air being released into the blower set's surroundings.

4.3 PVO COMBINED SAFETY AND STARTING VALVES

Functions

The PVO combined valve has two functions. When the blower is starting, the valve gradually increases the air pressure, thus increasing the torque – starting valve function. When the blower is in operation, the valve protects it against overload (against pressure increase over the permissible limit) – safety valve function.

Valve description

The numbers of the main parts correspond to the numbers of the positions shown in Appendix 4 (PVO combined valve assembly): control valve (1), mobile base (2), bottom base (3), top base (4), bellows flange (5), hose (6), guide rod (7), bellows (14), and springs (15).

4.3.1 STARTING VALVE FUNCTION

If there is no pressure, the main valve is open – the springs (15) lift the bottom base (3). When the blower is starting, pressure is generated in the gap between the seat and the disc. The control valve will feed the pressure into the bellows. As the bellows area is larger and the bellows power is higher than those of the seat, the bellows will close within several seconds due to gradually increasing pressure, thus enabling the blower to start with the load increasing fluently. The bellows must simultaneously press the springs (those ensuring that the unloaded valve will open). If the unloaded valve were closed, it would not serve as a starting valve. By removing the springs, you could disengage the starting valve function.
By installing a solenoid valve (a special design), you could control the blower's start-up time electrically. When the electromagnet of this valve is turned on, the inner space of the bellows is interconnected with the atmosphere and the main valve is open.

4.3.2 SAFETY VALVE FUNCTION

During normal operation, i.e., after the blower has started, the main valve disc is closed. The control valve interconnects the spaces of the outlet pipeline and the bellows. If pressure exceeds the adjusted limit, the control valve will release it into the atmosphere. This will result in reducing the pressure in the bellows and opening the main valve disc. After the pressure has dropped, the control valve will stop releasing the pressure into the atmosphere, thus increasing the pressure in the bellows and closing the main valve disc.

4.4 NOISE-DAMPING HOOD

Acoustic enclosures serve to reduce the blower set noise.
Acoustic enclosures are steel with absorption damping material. The enclosures are equipped with fans ensuring forced ventilation. The intake and exhaust openings for cooling air are fitted with silencers. During forced ventilation, the fan exhausts air out of the enclosure. The enclosures enable the machine to be installed both outside and in the machine hall. The types of outside enclosures up to K 552 differ from the inside enclosures only in their finish. The K 802 outside enclosures also have small roofs. You can find the dimensions of the appropriate enclosure types in their dimensional drawings.

CAUTION
Forced acoustic enclosure ventilation does not replace machine hall ventilation.

4.5 Use

Blowers are used to transport and compress gases. Since the rotors neither touch each other nor are in contact with the casing, blowers are suitable for oil-free transport and gas compression. During transport, media are not contaminated with either abrasion particles or oil.

4.5.1 Work media

Standard blowers are designed to compress or exhaust air or non-aggressive and non-explosive gases. If you may need further assistance in using the blower with special gases, please contact Rietschle Thomas.

4.5.2 Suction and discharge temperatures

Suction and discharge temperatures depend on the compression degree. Both temperatures are stated in the calculation of the blower set parameters. Such calculations are included in the offers of the blower sets. In standard blowers, the maximum temperature of the discharged medium is 140 °C. In order to prevent the temperature from exceeding the limit value in the discharge section (even during the highest medium compression), the intake medium temperature must be below 40 °C.

4.5.3 Suction and discharge pressures

The suction and discharge pressures are stated on the type plates of the blower sets and in the calculations of the blower set parameters. The maximum permissible differential pressure is stated on the blower type plates. The pressure at the blower's discharge flange is referred to as p_v, the pressure at the blower's suction flange is referred to as p_s, and the pressure at the flange that connects the blower set with the pipeline system is referred to as p_3.

4.5.4 Lubricant specification

The following table provides oil charge volumes for blowers:

Oil charge volumes

Oil charge			
Type WPB / WVB	**Drive side [l]**	**Gear side [l]**	**Total [l]**
120	0.07	0.1	0.17
300, 400	0.1	0.15	0.25
430, 550, 750	0.2	0.45	0.65
780, 1000, 1300	0.55	0.7	1.25
1600, 2000	0.75	1.4	2.15
3300	1.5	2.75	4.25
4000, 5000	1.4	2.6	4
6500, 7000, 8300	5	6	11

The prescribed **oil is fully synthetic motor** (automotive) oil, **Rietschle Thomas GEAR LUBE 150**:

Use of different oils (e.g., for applications in the food-processing industry) must be consulted with Rietschle Thomas.
Electric motor lubrication is described in the enclosed electric motor manual. There are no other lubrication places in the blower sets.

4.5.5 Maximum temperatures of the lubricating system

The maximum temperature of the oil charges must not exceed 120 °C (standard stabilization of the blower bearings).

4.5.6 Maximum speeds

4.5.6.1 Pulley revolutions

The maximum revolutions of the pulleys correspond to those of blowers.
The used designs of the pulley guards or the acoustic enclosures are tough enough to withstand any damage (break-off and/or tear) caused by broken belts.

4.5.6.2 Work medium speed

- The speed in the openings for intake and exhaust of air from the machine hall: between 5 m/s and 10 m/s;
- The recommended speed in the pipeline: 22 m/s;
- The maximum speed in the discharge pipeline: 35 m/s; and
- The maximum speed in the suction pipeline: 30 m/s.

4.5.7 Necessary safety equipment

If the delivery contains no blower discharge pressure gauge, you must install it on the discharge pipeline. The used pressure gauge must be glycerine or with an absorber in order to ensure reliable functioning.

4.5.8 Warning against use in the explosion-hazard environments

WARNING!
Blowers of standard types are not designed for use in explosion-hazard environments!

4.5.9 Recommendations for operation at a temperature of 0 °C and lower

The minimum ambient temperature when the blower set operation is still stable is -20 °C. Nonetheless, blower sets can be operated for a short time at a temperature as low as -30 °C. Such restrictions apply particularly to the belts, standard types of electric motors, and PVO valves. The blower set contains no water cooling. The minimum volume of condensate that builds up in the discharge pipeline cannot affect the blower set operation.

4.5.10 Application fields for blowers and blower sets

Wastewater Treatment Plants
- Increasing the volume of oxygen in water and keeping bacteria above the surface; and
- Ventilating activated sludge and detritus tanks in wastewater treatment plants.

Pneumatic Transport
- Transporting all kinds of loose materials, granules, and variously-grained materials.

Other Applications
- Backward rinsing of filters in water treatment plants;
- Release of material from silos (storage tanks);
- Clarification of loose materials and mixtures;
- Vacuum transport;
- Exhaust of air from various equipment systems at an absolute pressure of up to 500 mbar; and
- Supply of process air at a pressure of up to 1000 mbar.

4.5.11 Electric equipment data

The standard deliveries of blower sets contain no wiring or control units. The basic data about the installed electric and electronic devices are stated on their type plates and in their accompanying documentation (manuals, connection diagrams, etc.). The electric part supplier must ensure conformity with the requirements of the appropriate standards. The requirements for of equipment with electric motors, the nominal current of which is below 16 A, were not verified because the emission of such equipment depends on the installation and properties of the equipment complex where the equipment is used. If the delivery contains a switchboard with a control unit, the unit's basic data are stated in separate operating instructions.

4.5.12 Certificate of conformity

A Declaration of Conformity in accordance with the Czech Republic's Act No. 22/97 Coll. and the European Union Council's Directive No. 98/37/ES is enclosed with this Manual.

5. Operating the machine

For at least the guarantee period, you must keep an operating diary where you record operating dates, maintenance, inspections, and repairs. Keeping the operating diary during the guarantee period is a precondition for accepting guarantee claims. This applies particularly to the checks stated in Tables 5 and 6.

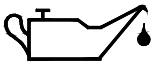
Since acoustic enclosures have the same function as belt drive guards during machine operation, standard blower sets placed in acoustic enclosures are not equipped with these guards. Only authorized persons whose familiarization with the risk of touching rotating parts can be proved are allowed to execute operations that are directly related to putting the blower set into operation, and those operations that must be performed when the acoustic enclosure during blower set operation.

5.1 Inspection prior to first turning on the blower set or blower

Installation Inspection
- Check the installation of the machine and attachment of the anchoring bolts;
- Check proper installation of all parts that could be left unattached during installation. Check especially those parts that could endanger the operators if they were not attached and/or installed; and

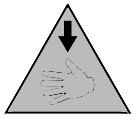
- Check all valves in the discharge pipeline whether they are open.

Connecting elements
- Check whether all connecting elements are installed and tight.

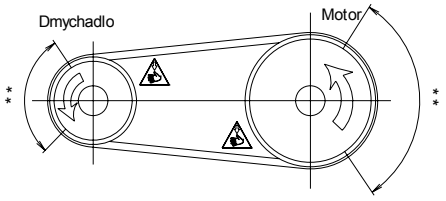


Filling with oil
Blowers are transported **without** oil. The approximate volumes of oil charges and the recommend types of oil are stated in Table 1 and Table 2 respectively (Chapter 4.5.4). On no account should oils be mixed! See Chapter 5.5.1 for more information.

Movement inspection
Check whether the blower moves smoothly (turn the pulley slowly with your hand).



WARNING!
You might be hurt when turning the pulley. You must hold the pulley at the places of contact with the belt **).



Be careful you do not crush your fingers!

Pipeline Inspection
Check whether the suction and discharge sides are clear.

Inspection of the direction of rotation
Turn the blower on for no more than 1 second. If it were turned on for a longer time and the direction of rotation were incorrect, the blower could be damaged. The blower drive must turn in the direction indicated by the arrows.

FORBIDDEN!

Backward running will damage the blower.

FORBIDDEN!

Do not turn the blower on again when it is still running down. Otherwise, it could be seriously damaged (the blower must be turned on only when at a standstill).

5.2 First turning on the blower set or blower

Take care the following steps:

- Open the acoustic enclosures (if installed).
- Turn on the electric motor. Check the position of the stop bolt (the pendulous motor frame must not hit the bolt).
- Check the functioning and adjustment of the safety valve when the machine is in operation.
- After approximately 1 minute, check the operating pressure. When the specified pressure is reached, turn off the drive unit.
- Observe the blower running down. The blower must run down smoothly, without impacts and/or sudden stop.
- Check whether the direction of fan rotation is correct - air must flow from the opening above the top wall of the noise-damping hood.

Safety valve functioning inspection
You should check the functioning of the safety valve and the mobility of the sealing cone during operation, at a pressure of 80% (or higher) of the opening pressure. If HEROSE valves are used in smaller blower sets, it is necessary to check the cone mobility. You must unload the cone by loosening the knurled nut in the valve body cover. You must turn the nut until it moves with difficulty, then turn the nut a further approximately 180°. The cone will be unloaded and the safety valve will start releasing air. Then you must tighten the nut again. Larger blower sets are equipped with safety valves with control valves. After one end of the hose has been disconnected from the control valve, the "bellows" space will open into the atmosphere and the valve will open automatically. After re-connecting the hose, you must check the joint for tightness (for example, with soapy water).

5.3 Trial operation

- Check, monitor and document the operating pressure and temperature;
- Monitor the noise level and vibrations when the blower set is in operation;
- Check the temperature on the blower surface for local overheating; and
- Check the state and volume of oil in the oil level gauges.

Table 3 – Maximum oscillation power of blowers

Type Blower revolutions [1.min^{-1}]													
WPB/WVB	120	300	400	430 550	750	780 1000	1300	1600	2000	3300	4000 5500	6500 7000	8300
	5000	**6000**	**5600**	**5500**	**5250**	**5250**	**4600**	**3000**	**3500**	**3000**	**2600**	**2200**	**1850**
Oscillation power [mm.s^{-1}]	**< 2**	**< 3**	**< 3**	**< 4**	**< 4**	**< 5**	**< 5**	**< 6**	**< 7**	**< 7**	**< 8**	**< 8**	**< 9**

Note: The power of blower mechanical oscillation is in accordance with the ČSN ISO 3945 Standard.

Table 4 – Maximum oscillation power of electric motors

ELECTRIC MOTOR										
Type	**56 - 132**			**160 - 225**			**250 - 280**		**315 - 355**	
Category	**N**	**R**		**N**	**R**		**N, R**		**N**	**R**
No. of poles	**2,4,6,8**	**4,6,8**	**2**	**2,4,6,8**	**4,6,8**	**2**	**4,6,8**	**2**	**2,4,6,8**	**2,4,6,8**
Oscillation power [mm.s^{-1}]	**< 1.8**	**< 0.71**	**< 1.12**	**< 2.8**	**< 1.12**	**< 1.8**	**< 4.5**	**< 4.5**	**< 4.5**	**< 1.8**

Note: The power of electric motors' mechanical oscillation is in accordance with the ČSN ISO 35 0000 Standard, Part 14 (IEC 34-14), Category N – normal, Category R – reduced.
If the values stated in Tables 3 and 4 are exceeded, you must contact the RT service department!!!

5.3.1 Check intervals for the trial operation

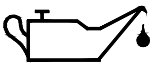
- During the first two operating hours, a permanent operator records values in a report every 15 minutes.
- During the next two operating hours, the permanent operators record values in the operating diary every 30 minutes.
- During another eight operating hours, the permanent operators hourly record values in the operating diary.

5.4 Emergency stopping controllers

No emergency stopping controllers are normally delivered with the RT compact units. The electric part supplier is required to ensure their installation.

5.5 Setting and adjustment instructions

5.5.1 Filling and changing the oil



The blower has two separate oil charges.
Oil is filled through the filling holes in the tops of both covers. After removing their caps, you can pour in oil. You should use a funnel so that oil will not leak uncontrollably into the surroundings, stain the belt drive, etc.
Oil is discharged through the drain holes in the cover bottoms. Used oil must be drained into sufficiently large tanks. After removing the drain hole cap, you must also remove the filling hole cap so that oil can drain freely into the tank and a vacuum cannot build up when oil is being discharged. You must visually check the used oil whether it does not contain metal particles or metal dust. The presence of such substances might indicate the initial stage of malfunction of either the bearings or the gear. In such cases, you must contact the RT service department.
The blower can be refilled with oil only when all the remaining oil has drained away and the drain hole cap is closed.

While the maximum oil level is in the middle of the oil level gauge, the minimum level is 3 mm lower. The oil level **measured when the machine is turned off** must be maintained within these limits. When the oil level has reached the minimum, you must immediately top up with oil. Top up with oil carefully so that its level will not be above the middle of the oil level gauge. Otherwise, oil could leak through the release openings or into the blower when the machine is in operation.

Depending on the operating conditions, the blower oil temperature could exceed 100 °C. Thus, you must drain and top it up with oil when it is cool! Otherwise, you could burn yourself.

Greases (motor):
The bearings of the smaller standard electric motors are lubricated by a permanent grease charge. The bearings of the larger electric motors must be greased. The greasing procedure is described in the directions for motor use.

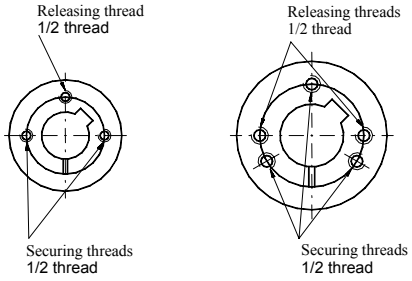
5.5.2 Replacing the filter inserts of the suction filter

Increased underpressure in the blower's suction part indicates suction filter clogging (indicated by a red strip in the filter clogging sensor). If a pressure gauge is used instead of the filter clogging sensor, the working section and the state of increased underpressure are marked in green and red respectively. If the filter is clogged, you must replace its filter insert. You can order filter inserts; their part numbers are stated on their flanges or in the Certificate of Completeness and Quality.
After replacing the filter insert, you must release (by pressing) the mechanical catch of the filter clogging sensor so that the red strip indicating increased underpressure will disappear.

5.5.3 Pulleys and belt tension

Pulleys
The standard blower sets are equipped with V-belt drives. Taper Lock bushings transfer the torque from the pulleys to the shafts.

Taper lock clamp bushings – Disassembly and assembly
Disassembly procedure
Loosen and remove all bolts. Screw bolts onto the releasing threads. Tighten the bolts evenly (gradually tighten the bolts opposite one another) until the clamp bushing is released from the pulley.



Assembly procedure
Degrease the shaft journals, clamp bushing and pulley hole. Put the clamp bushing in the pulley. Position the half threaded hole so that the holes of the bushing and the pulley fit. Oil the bolts slightly and screw them into the securing holes. Do not tighten them yet! Put the clamp bushing together with the pulley on the shaft. Now you can evenly tighten the bolts with a torque wrench. Tighten them gradually up to the stated torque ($\mathbf{M_s}$). Check the bolts for correct tightening (according to the torque) after the clamp bushings have been in operation for a short time. Put grease into the empty threaded holes to prevent dirt from collecting.

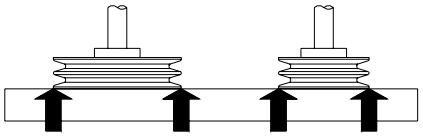
Table 5 – Torques according to the clamp bushing types

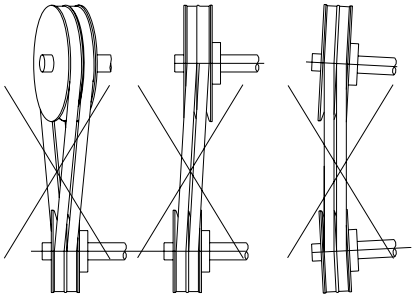
Type	1008	1108	1210	1215	1310	1610	1615	2012
M_s [Nm]	5.6	5.6	20	20	20	20	20	31
Type	2517	3020	3030	3535	4040	4545	5050	
M_s [Nm]	48	90	90	112	170	192	271	

V-belt Maintenance
Belts are tensioned depending on the transferred output. During operation, the optimum belt tension is ensured automatically by tilting of the pendulous motor frame. The tilt of the pendulous motor frame is limited by the stop bolt (see Chapter 3.6). After the belts have been lengthened, you must readjust the bolt so that the pendulous motor frame will not hit it when the motor is starting.
The belt drive parameters (the sizes and types of pulleys and the number and sizes of belts) have been designed and optimized for the required gear ratio and transferred output so that the V-belts will be maximally employed. **If any functional drive belt is missing, you must always put on the belt drive a new set of belts of the same type and size. You must always use belts with a guaranteed peripheral speed of 50 m.s^{-1}! You can find the type and length of belts in the Certificate of Completeness and Quality.**

Long operating life of the designed belt drive is assured if all conditions for regular maintenance are observed and the replaced belts are the same as those originally designed by Rietschle Thomas.

The parallelism of the shafts of both the blower and the motor and the alignment of the pulley grooves are ensured when the machine is being produced. When reassembling the pulley, you must put it on the shaft so that the faces of both pulleys are levelled. The maximum permissible deviation is 0.4% (the maximum gap between the rule and the pulley is 4 mm per one metre). When reassembling the motor, you must ensure that the shafts are parallel and the pulleys are levelled according to the picture:



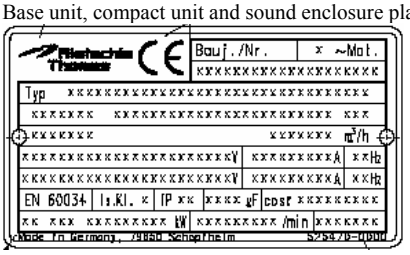


5.6 Running without operators

Since blowers normally work without operators being present, they must be protected against overload and/or sudden failures.
The electrical part supplier is responsible for current overload protection.
The machine owner must ensure that the machine will not be overloaded by the safety valve's being permanently relieved. This applies mainly to simultaneous operation of several blower sets (e.g., in wastewater treatment plants) when one discharge branch is closed but the volume of supplied air is not reduced to the necessary volume (by reducing the revolutions or turning off one of the blower sets). Blower set operation during which the safety valve releases air for a long time causes pressure fluctuations that significantly shorten the operating life of both the bearings and the non-return valve. They might also damage the blower.
In order to ensure thermal overload protection, it is suitable to arrange electrical control of the permissible temperatures of both the discharged air and the surroundings (a thermal sensor connected to a signalling device or machine stopping).

5.7 Plates and labels used on base units and compact units

Plates and labels on base units and compact units:
Base unit, compact unit and sound enclosure plate



The following cardboard label is hung on the suction sensor, pressure gauge or blower itself (if delivered separately):

TRANSPORTED WITHOUT OIL

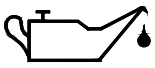
The correct direction of rotation is indicated by the following arrow placed on the blower cover (near the shaft) and the belt guard:

In accordance with the EN 1012 Standard, the following labels are placed on the blower and blower sets (according to their types):
- C1 Order: Read the Directions for Use

- C2 Required activity: Order to wear ear protectors

- C7 Warning: High temperature risk

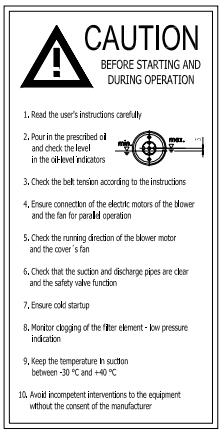
- C19 Oil filling



- C 21 Suspension point

- Plate - warning

- "ATTENTION" red plate.
On the suction silencer or the acoustic enclosure.


CAUTION
BEFORE STARTING AND DURING OPERATION
1. Read the user's instructions carefully
2. Pour in the prescribed oil and check the level in the oil-level indicators
3. Check the belt tension according to the instructions
4. Ensure connection of the electric motors of the blower and the fan for parallel operation
5. Check the running direction of the blower motor and the cover's fan
6. Check that the suction and discharge pipes are clear and the safety valve function
7. Ensure cold startup
8. Monitor clogging of the filter element - low pressure indication
9. Keep the temperature in suction between -30 °C and +40 °C
10. Avoid incompetent interventions to the equipment without the consent of the manufacturer

- "ATTENTION: CUTTING EDGE" plate.
On the sub frame of the blower set, below the pendulous motor frame.

5.8 Instructions for tracing simple failures

Blower operation failures can be divided into two main categories:
- Mechanical failures (bearings, toothed wheels, rotors, etc.); and
- Electrical failures (faulty drive, wiring, contactors, fuses, etc.).

If any electric failure occurs, you must notify the specialists authorized to repair such failures.
If you are unsure about the correctness of your procedure, call the Rietschle Thomas service department.

FAILURE	POSSIBLE CAUSE	REMOVAL
The machine will not start	Electrical part failure	Check the wiring, contactors, fuses, thermal or other protection, and cable connection state. Check the state and functioning of the electric motor.
Oil leaks through the ventilation openings	High oil level (measured when the blower is turned off)	Drain excessive oil.
Elevated noise level, the blower makes a “metallic” sound	Blower rotor knocking, bearing failure or incorrect setting of the limit clearances	Repair by the Rietschle Thomas servicemen
High current consumption	Bearing failure or seizing of the rotors in their working space	Repair by the Rietschle Thomas servicemen
	High overpressure in the outlet pipeline	Measure the overpressure and remove the cause.
	High vacuum	Replace the filter inserts.
High temperature of the cover at the blower pulley	No oil in the blower	Repair by the Rietschle Thomas servicemen
	Bearing failure	
High temperature of the cover at the gear	No oil in the blower	Repair by the Rietschle Thomas servicemen
	Failure of the bearing or gear	
Slipping belt	Greasy belt	Clean both the belt and the pulleys and degrease them with petrol.
The blower is loaded immediately after start-up (applies only to blower sets with PVO valves)	Disengaged starting valve function	Set the combined safety and starting valve so that it will be open when the machine is turned off.
The blower turns spontaneously in the opposite direction when being turned off	Malfunctioning non-return valve	Check the non-return valve and replace if necessary.
		Disassemble the pipeline and replace the sealing ring.
The safety valve releases air when the blower is in operation	High overpressure in the outlet pipeline	Measure the overpressure in the outlet pipeline and remove the cause *) The safety valve is set for maximum + 10% of the outlet overpressure.
	Failure of the combined safety and starting valve	Remove leakage and dirt from the control valve, and/or replace the rubber bellows.
The safety valve sucks air when the blower is in operation	High vacuum in the inlet pipeline	Measure the vacuum in the inlet pipeline and remove the cause *) The safety valve is set for maximum + 10% of the vacuum.
The safety valve will not open when the full blower load is exceeded	The safety valve is clogged with dirt (applies to the Herose valves)	Disassemble and clean the valve.
An overheated blower	Dirty filter insert	Replace the filter insert.
	Overload	Maintain the load - data.
	Large piston clearances	Repair by Rietschle Thomas
No transport	Incorrectly installed non-return valve	Repair the installation.
	Slipped or broken belt	Belt failure and/or incorrectly set pulleys Blower failure
Low supplied volume	Incorrectly dimensioned blower	Compare the values with the efficiency table.
	Leaky safety valve	Check the valve setting and operating pressure.
	Slipping belt	Check visually the operation of the belt whether it runs without vibrations. Check the motor power. Recheck the belt state. Set the lower possible limit of the pendulous motor frame position lower by adjusting the stop bolt.
Vibration	The rotors touch each other	Check the bearings and gear setting.
	Damaged bearings	Replace the bearings and change oil
	Incorrectly aligned pulley and/or coupling	Adjust it/them and tension the belt of the belt drive.
	Loosened bolts securing the motor and/or blower	Tighten and adjust them.
	Rotor imbalance due to dirt	Clean the transport space and rotors.

*) The cause might lie in a project error, for example. At a specific flow, the pipeline resistance is higher than the overpressure (required when the blower parameters were being specified). This is usually detected when the blower is first turned on and/or when the projected machines are being put into operation. Another cause

might be a change in the resistance after the machine has been operated for some time. This is caused by pipeline clogging, clogging of the tanks' aeration openings in wastewater treatment plants, etc., or by operators' unfamiliarity (see Chapter 5.6).

5.9 Routine maintenance and checks

Table 5 – Blower checks

Operating time	Check	Lubrication
After 400 hours	Blower operation check. In a dry continental climate, preserve the rotors and cylinders after a six-week standstill. In a humid climate, preserve them sooner (see Chapter 2.3).	Check of the oil bath levels. First change of oil since the machine was put into operation.
After 4,000 [2] hours		Check of the lubrication discs functioning (the level moves slightly).
		Oil change
After 20,000[1] hours	Oscillation power measurement (bearings)	
After 40,000[1] hours	Bearings check by oscillation power measurement. Expected replacement of the bearings.	Oil change

Notes:

1) Executed by the Rietschle Thomas *servicemen.*

2) The oil change interval depends on the operating temperature of the oil bath (it also depends indirectly on both the input and output temperatures of the transported air). If the oil temperature does not exceed 50 °C, you can change oil annually (after 8,000 hours). If the temperature is higher than 100 °C, you must change oil four times a year (after 2,000 hours). If the temperature is 120 °C, you must change it monthly. You can detect the oil state by comparing an oil sample with new oil. Dark and/or thick oil indicates contamination or the initial stage of carbonization; i.e., you must change it. Analyzing an oil sample is more reliable.

Table 6 – Blower set checks

Operating time	Check	Lubrication
After 400 hours	Visual checks, checks of the blower set operation, bolted connections, operating pressure, discharge temperature, noise level, and noise-damping hood fan. Check of the safety valve functioning (check smooth operation of the PVO valve's closing piston).[2] Checks of the suction filter and the suction vacuum.	
After 800 hours	Checks of the driving elements, motor operation, and belt tension.	
According to the electric motors		Addition of lubricants to the bearings according to the recommendations of the motor Manufacturers; see the instructions for motor operation and maintenance.
After 20,000[1] hours	Expected minimal operating life of the bearings of the two-pole motors	
After 30,000[1] hours	Expected minimal operating life of the bearings of the four-, six-, and eight-pole motors	

Notes:

1) Executed by the Rietschle Thomas *servicemen.*

2) The control PVO valve maintenance – the valve need not be maintained during routine operation. Apart from the valve functioning check (see Chapter 5.2), you must ensure that all joints are tight, particularly after reassembling or handling the valve. With respect to the PVO 200 valve, you must also check the tightness of the cap in the top base if the lifting eye was used for valve handling (check the tightness with soapy water, for example). If any leakage occurs, the pressure in the rubber bellows will drop and the valve will open. The same effect is caused by a clogged sieve or a blocked nozzle of the control valve (you must clean the sieve or blow through the nozzle).

WARNING! During any service operation, the blower must be turned off and secured against being turned on. If technical conditions, cautions, and/or warnings are violated, Rietschle Thomas cannot provide a guarantee.
If your operation demands are unusual, please contact Rietschle Thomas.

When contacting Rietschle Thomas, please state the following:

- The serial number and type of the blower;
- The serial number and type of the blower set;
- The serial number and type of the motor;
- The failure(s); and
- The measures you have taken to remove the failure(s).

If the blower must be dispatched to the production plant, please drain oil. You should also lubricate the unpainted parts with preservative oil and put covers on the blower's suction and discharge sections. Motors to be dispatched for repair must be without pulleys and/or couplings.

For an additional charge, the Rietschle Thomas servicemen can execute the checks of blowers and blower sets mentioned in Chapter 5.9, Table 5, including diagnostic measurements of the bearing state and oscillation power of the blowers and electric motors. These precautionary activities could prevent serious failures.

Contact addresses:

www.rtpumps.com

5.11 Information on improper

- Standard blowers must not be operated if the direction of rotation is opposite.
- Standard blowers must not be pressure-overloaded; the maximum permissible compression ratio is 2.
- Standard blowers must not be thermally overloaded.
- Standard blowers must not be operated in explosion-hazard environments.
- The sizes of intake medium impurities must not exceed the values stated in Chapter 3.4.

5.12 Information on residual risks

Health and Safety Protection at Work

Rietschle Thomas blowers meet European Standards for health protection; nonetheless, they might endanger health. In order to prevent injuries, authorized workers must observe the following rules:

- The operators must be trained and instructed.
- All operations must be executed according to this manual.
- No solid, liquid, and/or powdery material must be present in the suction space.
- If you are unsure or uncertain, contact Rietschle Thomas.
- **Blowers must not be handled when the machine is in operation.**

- **Blowers must not be operated when the suction part is open because the rotors are accessible. There is a risk of touching them.**
- **Do not operate the machine if any of its guards is damaged (belt guards, fan guards, etc.).**
- Use protective gloves – the machine temperature is high when it is in operation or before it cools down.
- Use ear protectors when the acoustic enclosure is open or the machine is operated without such a hood.
- If the blower set is equipped with a acoustic enclosure, such a enclosure also serves as a solid guard cover. Separate pulley guards are not installed, which results in a residual risk – possible injury. It is thus forbidden to operate the aggregates if the enclosures are open.
- Since the pendulous motor frame is secured in its working position only by a belt(s), be very careful when standing in its working space. The position of this frame could change suddenly if a belt broke.

- Before maintaining and/or repairing the machine, you must disconnect it from the power supply and secure it against being turned on again.
- When detergents are being used, there is a risk of cauterizing or poisoning by fumes inhalation. Observe the directions and instructions of the detergent Manufacturers!

5.13 Places of excessively hot surfaces

Excessively hot surfaces:

- The blower;
- The discharge silencer;
- The discharge pipeline; and
- The safety and starting valve.

5.14 Equipment for protecting the operators against the residual risks

- Ear protectors; and
- Working gloves.

5.15 Spare parts

Consumable spare parts (filter inserts, belts, non-return valves, and/or oil) are delivered on customer request. They are not included in the standard delivery. The production plant repairs its own blowers. We can deliver sets of spare parts for individual blower types to external service organizations. Fixtures are necessary for both smooth assembly and disassembly. Bearing replacement is usually the main reason for repair. If any specific problem arises, contact the Rietschle Thomas service department.

Parts and material necessary for routine service and simple repairs of the blower set:
a) Filter inserts;
b) V-belts – the belt specification is stated in the Certificate of Quality and Completeness; and
c) Non-return valves.

6. TAKING THE MACHINE OUT OF OPERATION – WASTE DISPOSAL

Packaging
All packaging material is environmentally friendly and recyclable. The cardboard parts were made from waste paper. The wooden parts were not treated. The pallets can be sold to the nearest organization dealing in pallet purchase. The plastics are marked as follows:
>PE< polyethylene, e.g., the plastic film.

Base unit and compact unit
- Spare parts and/or the blower must be disassembled and cleaned of petroleum products. Dispatch the parts sorted according to the used materials for professional disposal.
- If the blower is still functional, you can offer it to the production plant for redemption by mutual agreement.

Operating oils
The recommended oils contain no polychlorinated biphenyls (PCB); for more information, see the safety data sheets of the oil.

7. NOISE LEVEL

7.1 General
The equivalent levels of the sound pressure A (measured at the workplace of operators by using the A weight filter in accordance with the EN ISO 11200, ISO 7574, and ISO 3740 Standards) are stated in the value tables in the Catalogue of Rietschle Thomas blower aggregates. The stated values express the actual values of noise levels of blower sets with or without acoustic enclosures.

7.2 Vacuum blower sets
With respect to blowers working at vacuum, you must take into account the fact that the catalogue values of the equivalent levels of the sound pressure **A** apply only when air is diverted by the discharge pipeline from the area where the blower set operates or when an additional discharge silencer is installed behind the outlet flange. If air is discharged into the surroundings behind the discharge flange of the blower set, the values of the equivalent levels of the sound pressure **A** are approximately 15-20 dB higher than the values stated in the Catalogue.

7.3 Pipeline noise levels
Noise emitting from the surfaces of either the suction or discharge pipelines is not included in the values of the equivalent levels of the sound pressure A. You must pay due attention when designing pipelines so that the excitation frequency of the blower will not cause them to resonate. It is necessary to select optimum diameters, wall thickness, and material of the pipelines, and the anchoring method, including the distances of the supports for both the discharge and suction pipelines. The excitation frequency of RT three-tooth blowers ranges between 100 and 500 Hz. The excitation frequency depends directly on the blower revolutions (the blower revolutions range between 1,000 and 5,000 1/min).
On customer request, we can supply an additional pipeline silencer for specific parameters of the blower. This silencer can prevent problems with noise emitted from the pipeline near, e.g., housing, etc.

7.4 Machine hall
You must also pay due attention to the pipelines in the machine hall. It is necessary to select flexible wall openings for the pipeline in order to prevent pipeline pulsation from being transferred to the walls of the machine hall. You must also pay attention to the wall material because it should absorb the emitted noise. If possible, avoid using smooth concrete walls or steel structures.

8. TRAINING OPERATORS

After the machine has been put into operation and transferred to the customer, it is necessary to train its operators.

Training Schedule:
1. Checking the volumes and states of the oil charges, topping them up, and changing them.
These operations are executed only when the blower set is turned off. The oil volume depends on the blower type. When oil is being topped up, its level must not exceed the middle of the oil level gauge.
The operators are notified of the necessity to use the recommended oils. The procedure for changing oil and the frequency of oil changes are explained to them.

2. Checking the state of the belt drive or the coupling

3. Checking and replacing the filter inserts

The necessity of such replacements is explained. The frequency of replacements depends on the ambient dustiness and the method of the blower set use.

4. Acquainting the operators with the correct procedure for starting
The operators are warned about the potential risks.

5. Acquainting the operators with the contents and importance of the accompanying documents - Operating Instructions and Certificate of Quality and Completeness.

6. Servicing the machine
The identification of failures and possible methods for removing them. The procedure for ordering servicing.

7. Transfer certificate
Both sides complete and sign the transfer certificate form:
- The copy is intended for LUTOS; and
- The original is for the customer.

9. PRESSURE DEVICE

According to the European Parliament and Council's Directive 97/23/ES, which stipulate the technical requirements for pressure devices, the discharge silencer of the blower set is classified as a pipeline part.

The device is equipped with safety valves:
1) Designed by LUTOS; the conformity of the valves has been assessed in accordance with the ES procedure for type testing. According to Section 3, Appendix No. 3 of the Government Decree, Number E-32-00220-02, the products are marked with the CE 1015 symbol.
Type testing was executed by Brno-based Strojírenský zkušební ústav s.p.

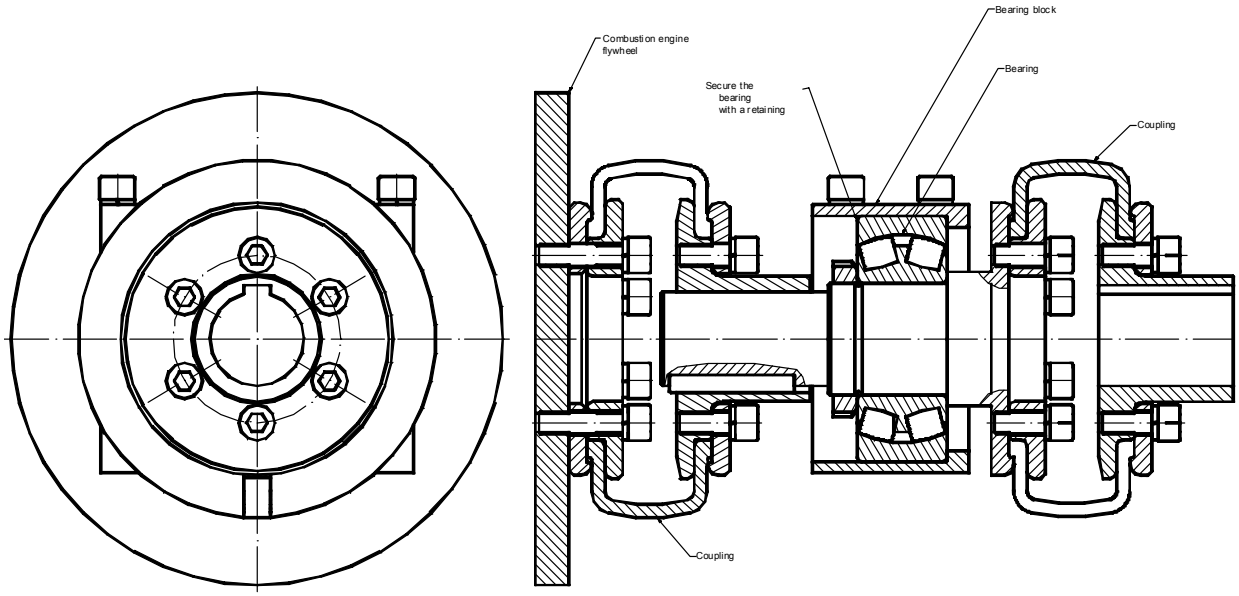
2. Purchased from the GMBH HEROSE company; the conformity of these valves has been assessed in accordance with the European Parliament and Council's Directive 97/23/ES. The products are marked with the CE 0045 symbol.
Type testing was executed by TÜV CERT-Zertifizierungsstell für Druckgeräte der TÜV NORD GRUPPE.

10. NON-STANDARD BLOWER DRIVE
(APPLIES ONLY IF A SEPARATE BLOWER IS PURCHASED)

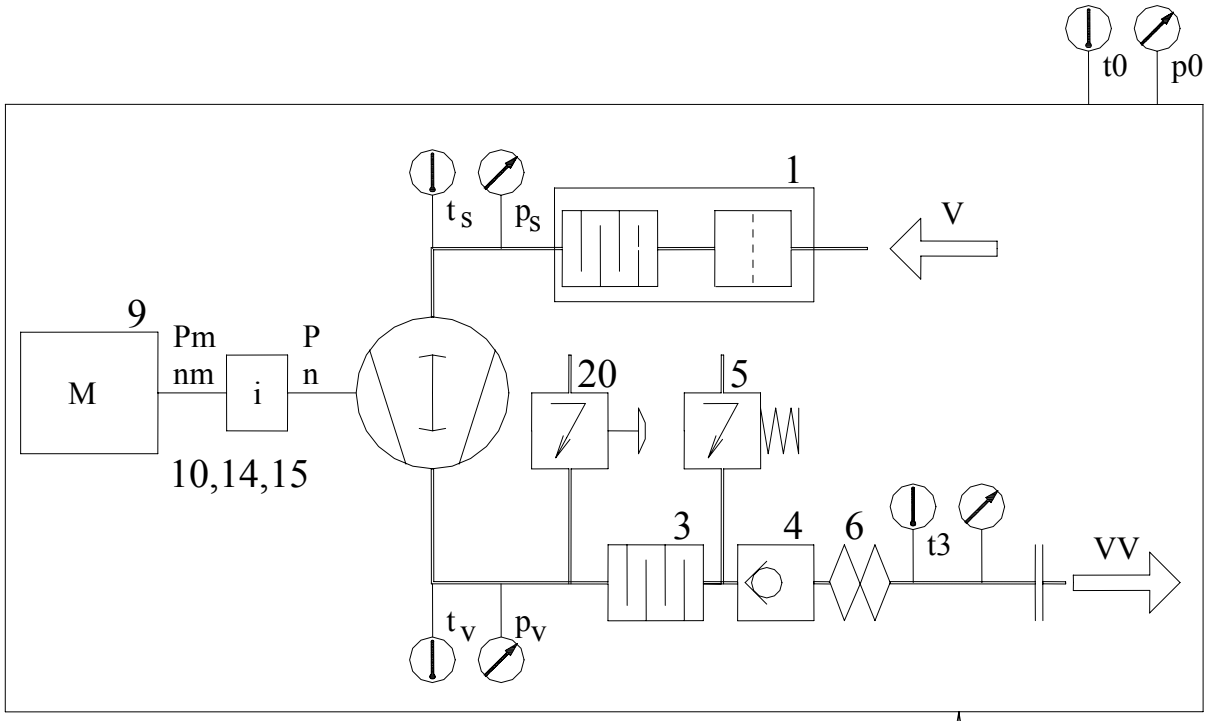
If an electric motor is not used as the blower drive (e.g., a combustion engine is used), the chosen design must prevent the output blower shaft from loading with a force higher than permissible. It must also protect the shaft against the vibrations transferred from the driving motor. For example, a direct connection with a propeller shaft is unsuitable.

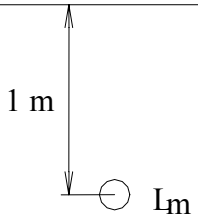
Design recommendations:
a) Both the blower and the combustion engine must be on the same frame. Only such a frame can be flexibly mounted. The engine vibrations must be within the acceptable limits.
b) A supporting bearing in a bearing block that will absorb the vibrations and forces must be installed between the blower and the combustion engine.
c) A flexible coupling (e.g., a PERIFLEX coupling) must connect the bearing with the blower. The type of connection between the plain-collar bearing and the engine could be similar; nonetheless, it is not absolutely necessary.

Arrangement Drawing:

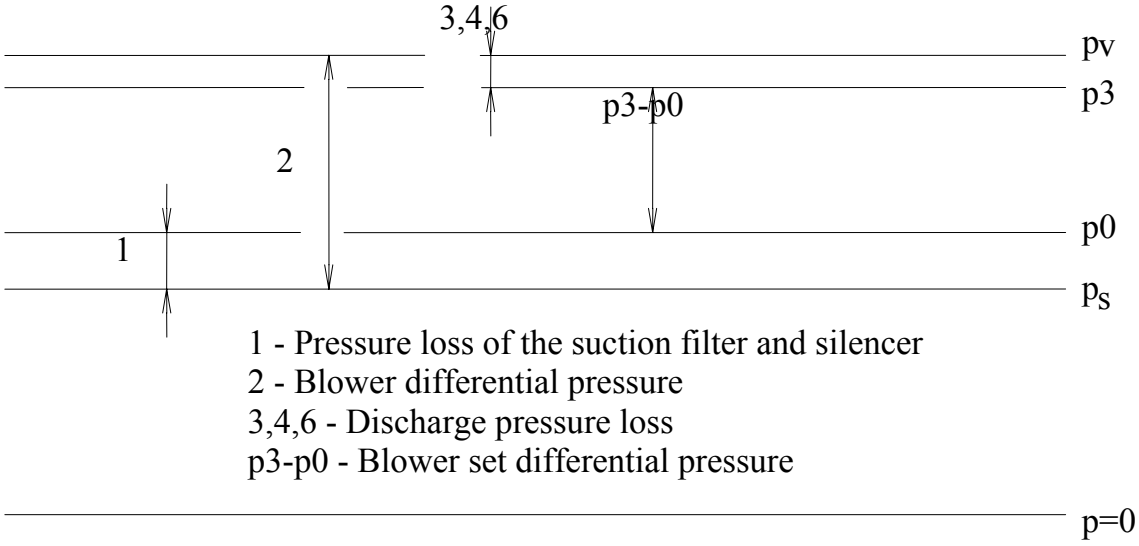


Another possible solution is using a non-standard blower equipped with an auxiliary plain-collar bearing of the output shaft in the cover.

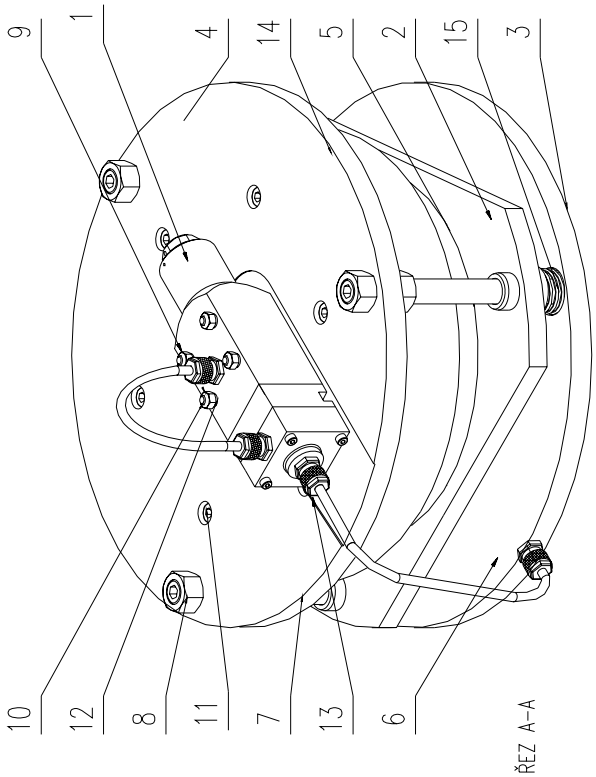




1 Suction filter and silencer
2 Blower
3 Discharge silencer
4 Non-return flap valve
5 Safety valve
6 Compensator
9 Electric motor
10,14,15 Belt drive



1 - Pressure loss of the suction filter and silencer
2 - Blower differential pressure
3,4,6 - Discharge pressure loss
p3-p0 - Blower set differential pressure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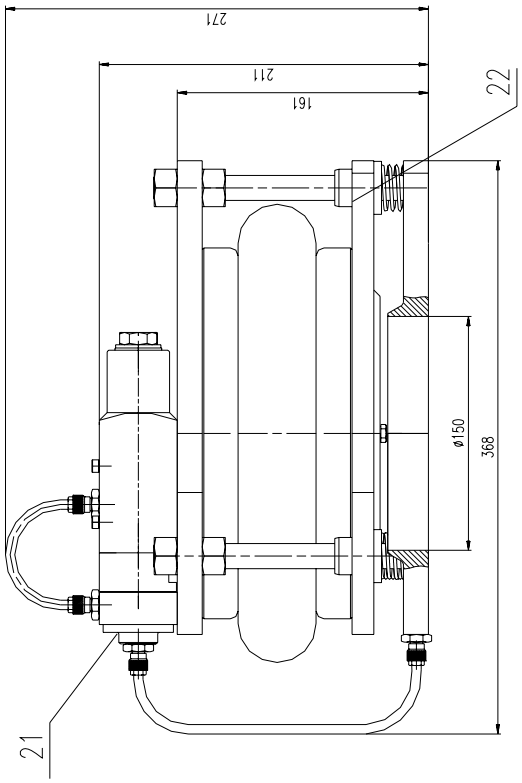
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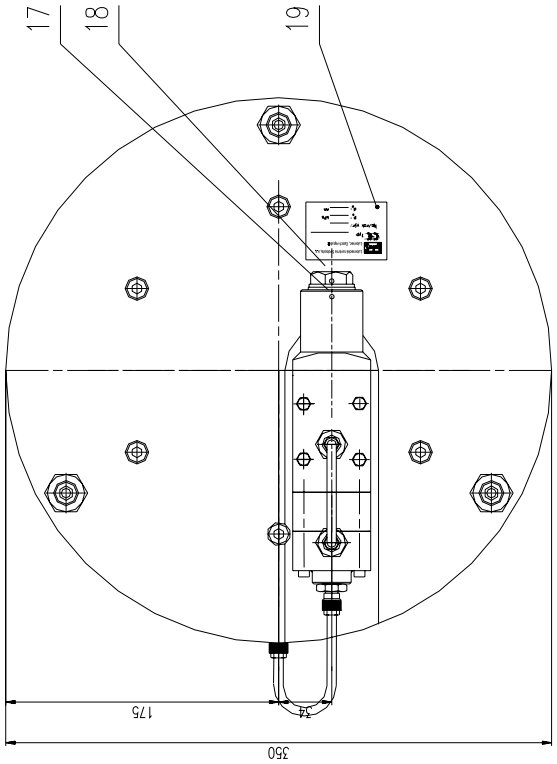
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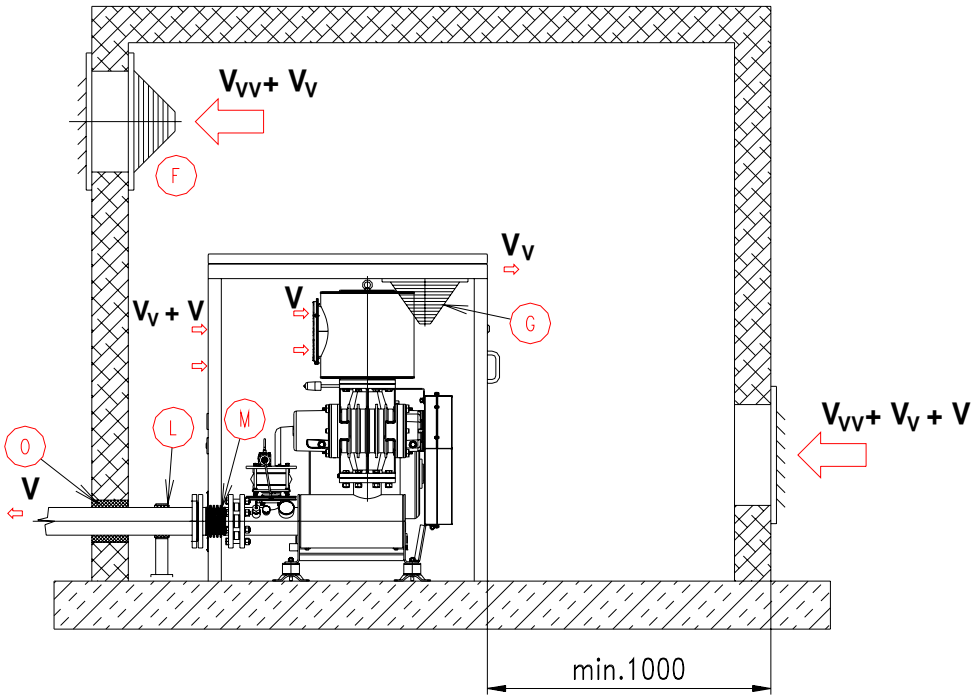
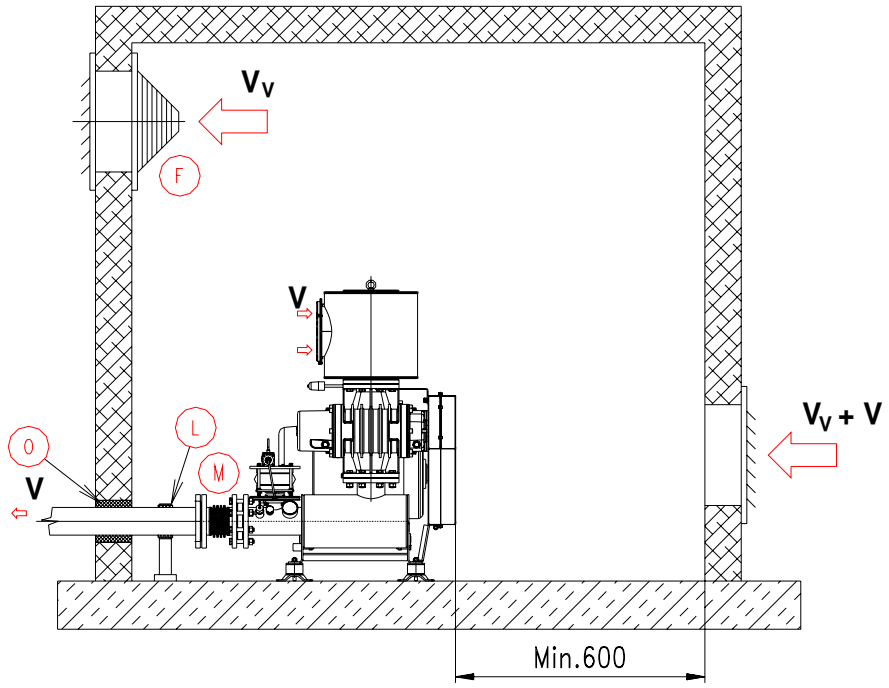
FORCED VENTILATION, THE BLOWER SET IS IN THE ENCLOSURE, THE BLOWER SUCKS AIR FROM THE MACHINE HALL

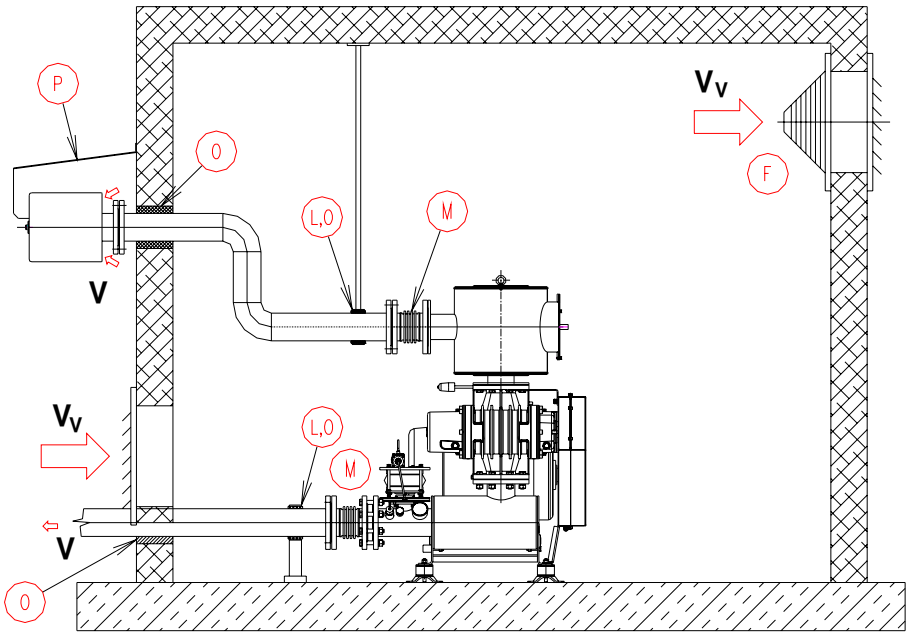


FORCED VENTILATION, THE BLOWER SUCKS AIR FROM THE MACHINE HALL

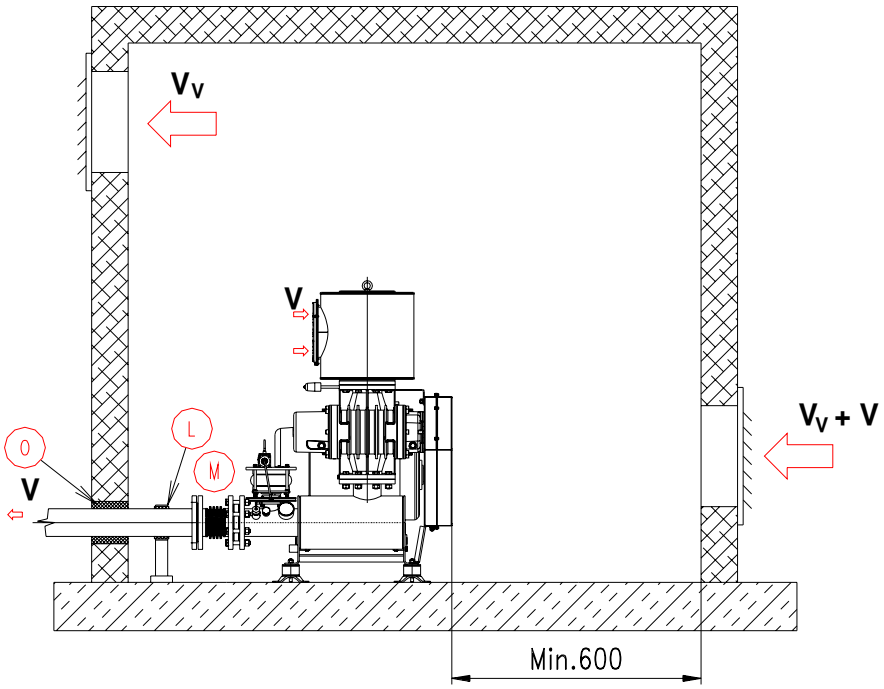


F	Fan
G	Fan
L	Fixed point
M	Bellows
N	Insulation
O	Flexible mounting

FORCED VENTILATION, THE BLOWER SUCKS AIR FROM THE OUTSIDE



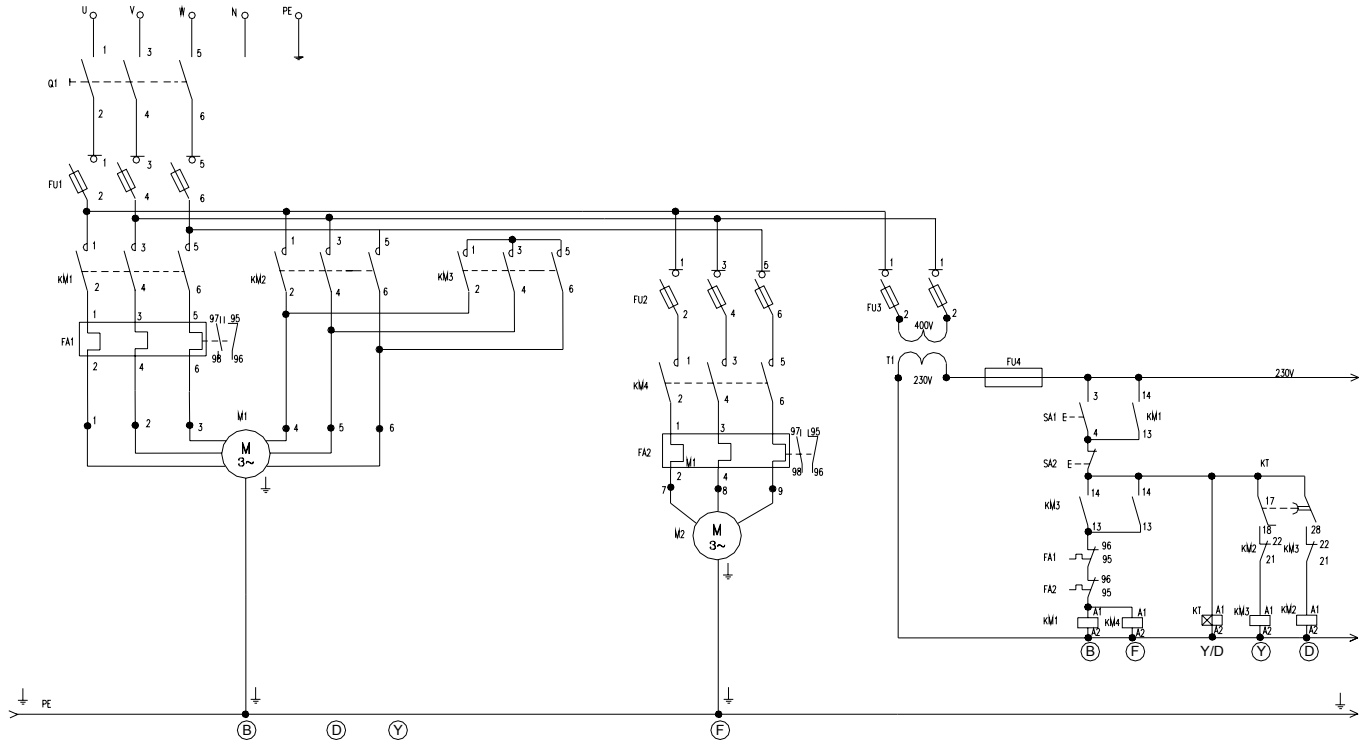
NATURAL VENTILATION, THE BLOWER SUCKS AIR FROM THE MACHINE HALL



F	Fan
L	Fixed point
M	Bellows
N	Insulation
O	Flexible mounting
P	Protective roof

CONNECTION DIAGRAM OF THE NOISE-DAMPING HOOD FAN (3×400V)

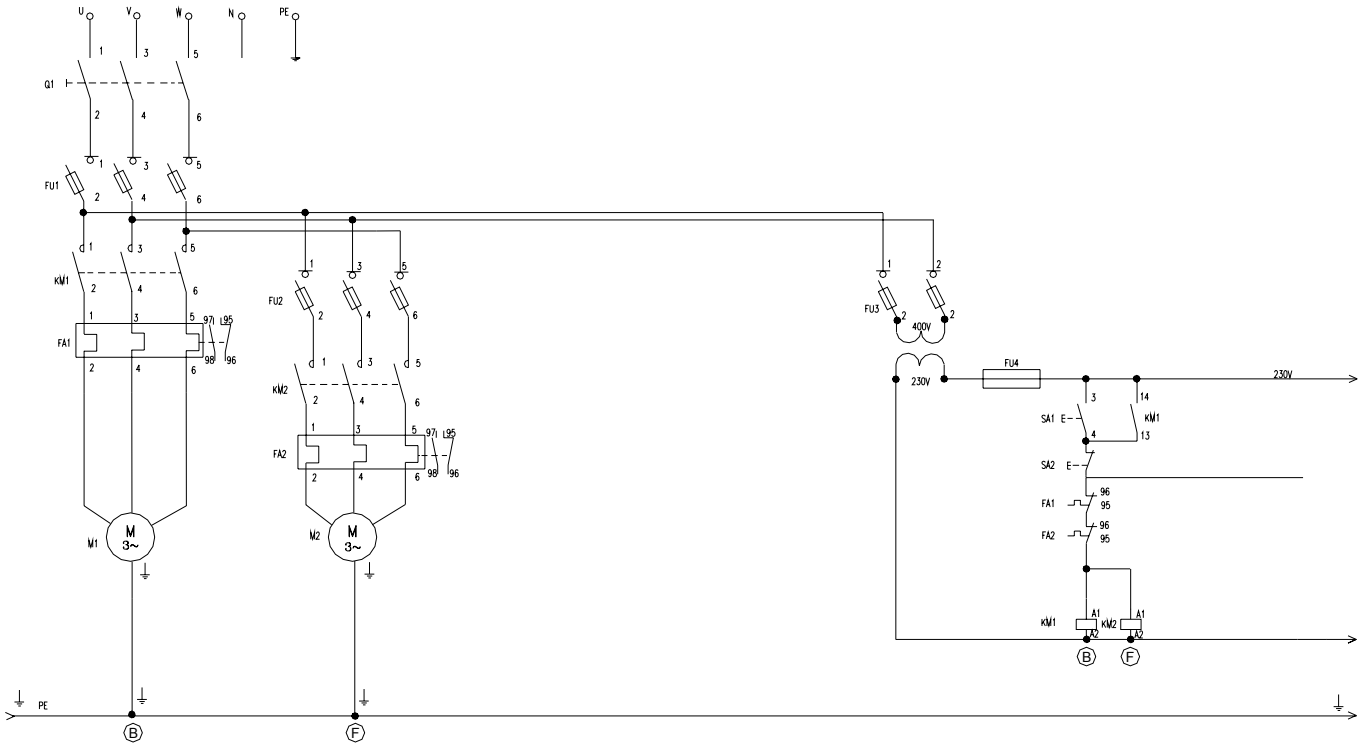
Blower motor 3 ~ ≥ 11 kW (Y/D); Fan 3 ~



B - Blower drive

F - Fan

Blower Motor 3 ~ < 11 kW (D); Fan 3 ~

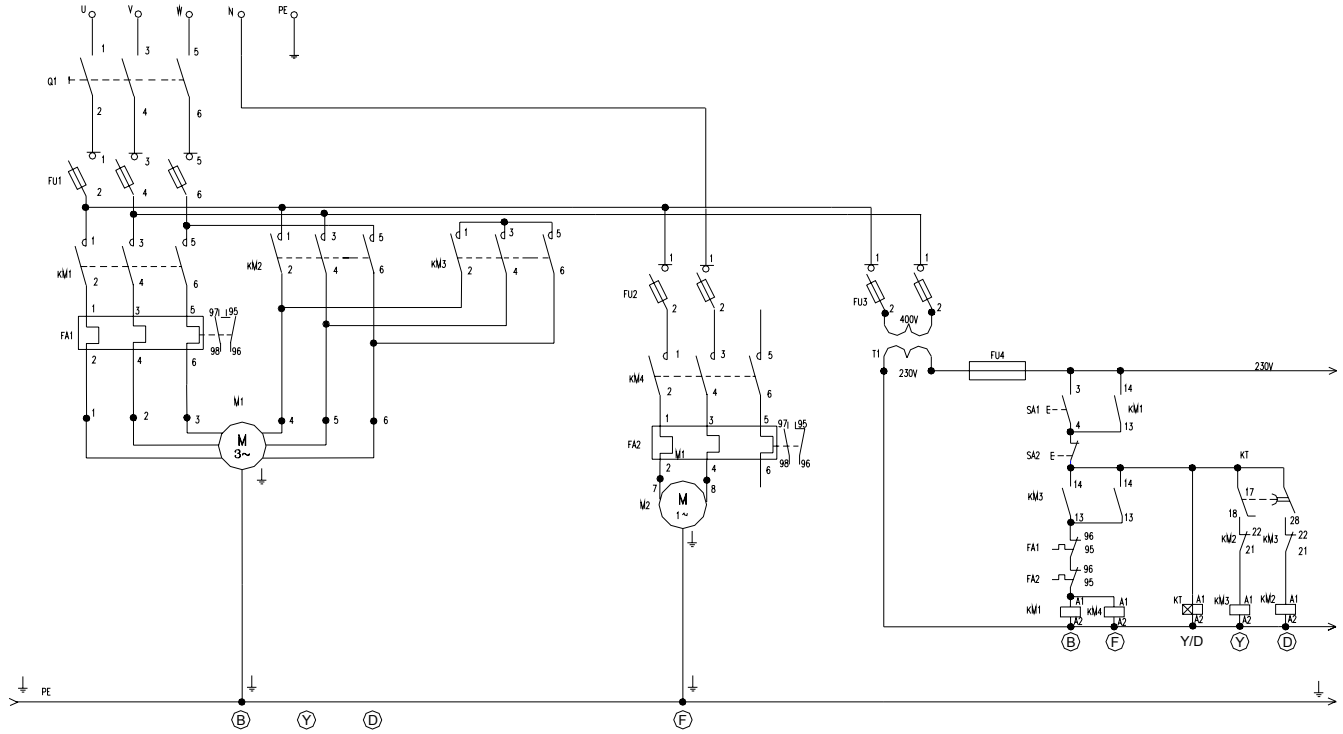


B - Blower drive

F - Fan

CONNECTION DIAGRAM OF THE ACOUSTIC ENCLOSURE FAN (1×230V)

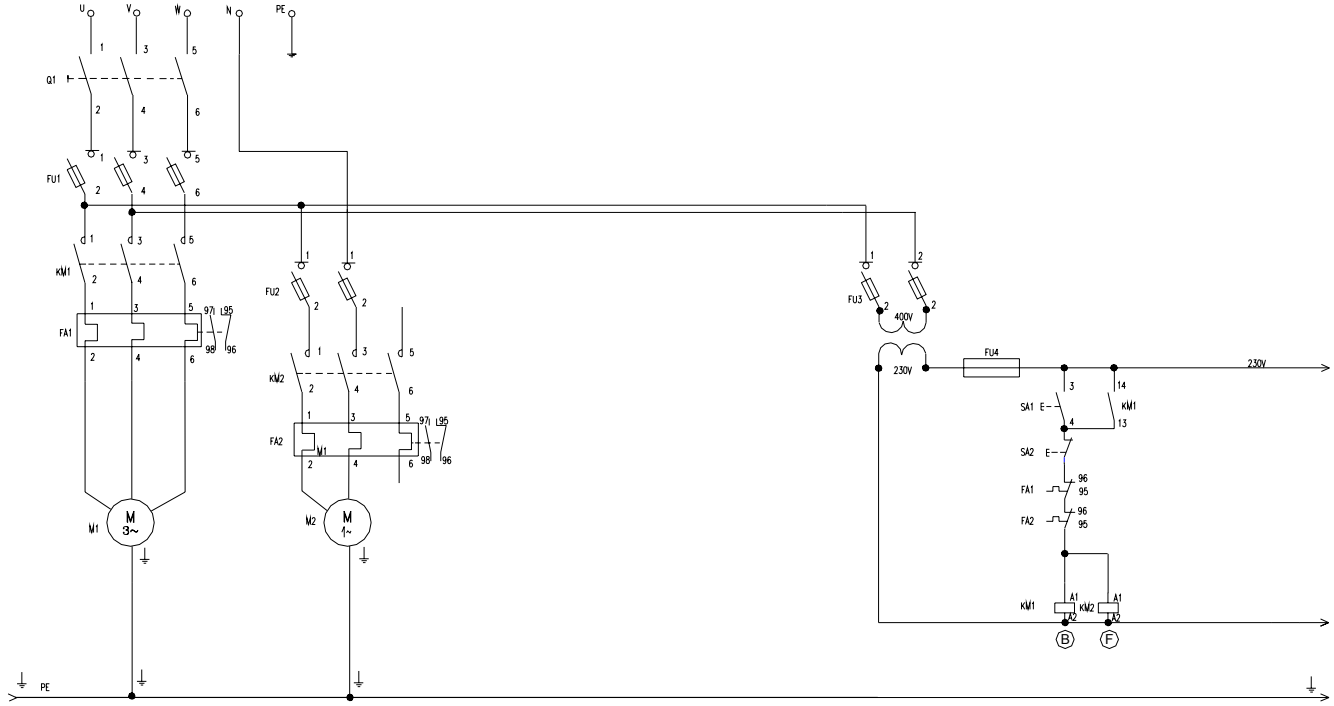
Blower Motor 3 ~ ≥ 11 kW (Y/D); Fan 1 ~



B - Blower drive

F - Fan

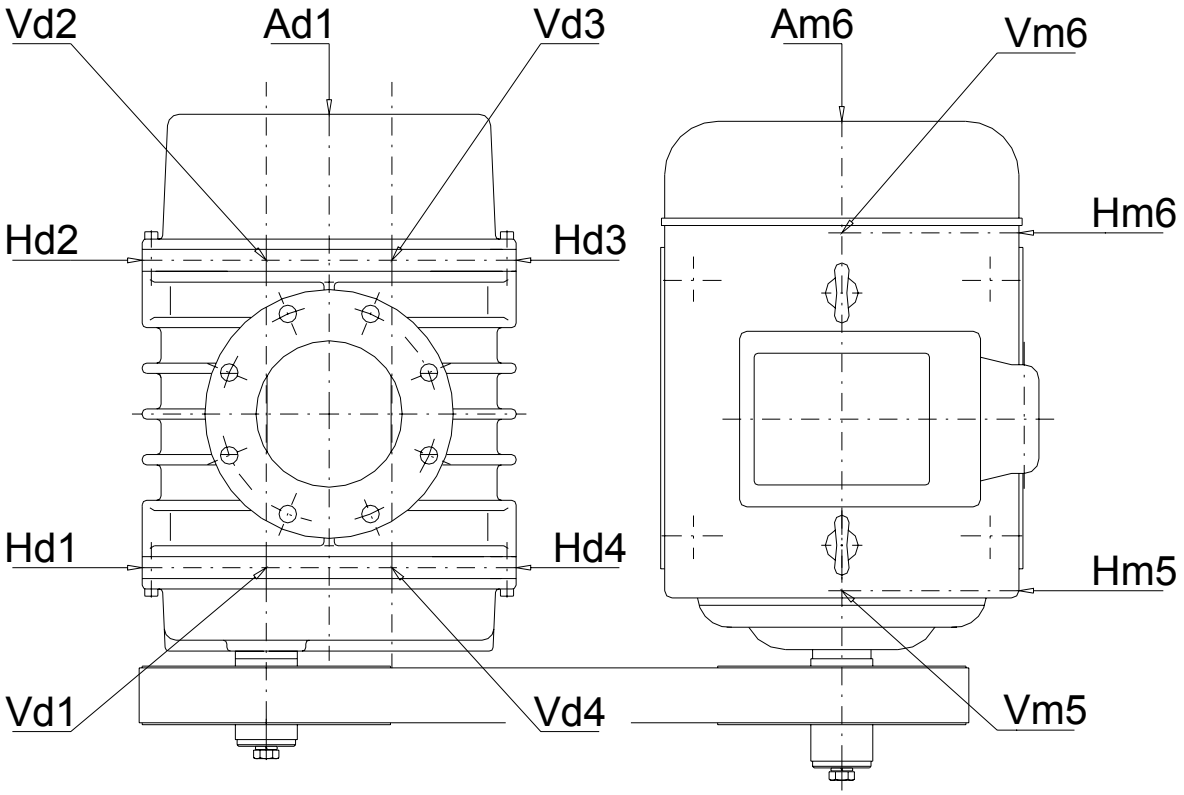
Blower Motor 3 ~ < 11 kW (D); Fan 1 ~



B - Blower drive

F - Fan

The picture shows the measurement points for the blower and electric motor. It is necessary to respect the point marking for simplification of mutual communication.



Vibration Measurement									
Measurement point		Vibration values - total value / Frequency [Hz] - Vibration value							
		C.V.	F	V.F.	F	V.F.	F	V.F.	F
		[mm / s]	[Hz]	[mm / s]	[Hz]	[mm / s]	[Hz]	[mm / s]	[Hz]
1	Vd								
	Hd								
	Ad								
2	Vd								
	Hd								
	-								
3	Vd								
	Hd								
	-								
4	Vd								
	Hd								
	-								
5	Vm								
	Hm								
	-								
6	Vm								
	Hm								
	Am								

The aggregates must be measured twice a year.